

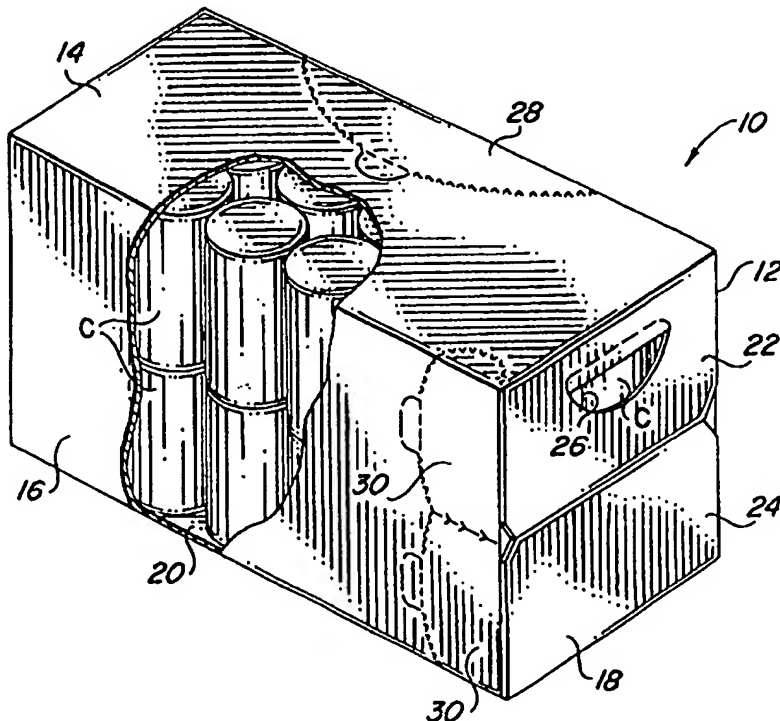
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(54) Title: CARRIER WITH ARTICLE DISPENSER**(57) Abstract**

An article carrier (12) having dispenser openings. The dispenser openings are in either a side panel (16) or end panel flaps (82, 84) and are designed to permit removal of one article (C) at a time from each of two stacked layers. Each dispenser opening is covered by a tear-away section (30) and is at least as long as the height of a packaged article (C). The height of the dispensers opening is less than the width of an article (C) throughout substantial portions of the dispenser openings (30). When the dispenser openings are in an end panel tear-away sections (30), the dispenser openings are provided in the end panel flaps (82, 84) as well as in underlying end panel glue flaps (108, 112).



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CARRIER WITH ARTICLE DISPENSER

Field of the Invention

This invention relates to carriers which contain a plurality of layers of articles in stacked relationship. More particularly, it relates to a carrier of this type which includes an article dispenser.

Background of the Invention

Sleeve-type carriers have long been used to package beverage containers and other articles. Basically, the top, bottom and side panels of the carrier are connected to form an open-ended sleeve configuration. The articles to be packaged, such as beverage cans, are loaded through one or both of the open ends so that their axes are parallel with the bottom panel and their ends abut the side panels of the carrier. The end panels of the carrier are then formed from flaps connected to the ends of the sleeve. Carriers of this type have sometimes been provided with a dispenser adjacent the bottom panel to allow one container at a time to be removed. A typical dispenser design is comprised of a tear strip which when removed creates an opening slightly smaller than an adjacent beverage can. The size of the opening is small enough to prevent an adjacent can from rolling out through it, but is large enough to permit the can to be grasped and pulled out past the flexible edges of the opening.

Sleeve-type carriers have more recently been designed to hold two layers of beverage cans in stacked relationship as a way of more efficiently packaging greater numbers of cans. In such an arrangement the cans are inserted into the carrier sleeve with their axes parallel to the side panels, so that the lower ends of the cans in the bottom layer abut the bottom panel and the upper ends of the cans in the upper layer abut the top panel. With these larger carriers a suitable dispenser is necessary as a means for conveniently removing cans one or two at a time.

One approach to such a dispenser is found in U.S. Patent No. 5,368,194 which provides two dispenser openings in an end panel, each opening being adjacent an end beverage can in each of the two stacked layers of cans.

The openings are separated from each other by a portion of the end panel, which makes the length of the opening less than the height of the beverage cans. The width of the openings varies from a minimum at the corners of the carrier to a maximum at the inner ends of the openings so that the height at the corners is less than the diameter of a can while the height at the inner end may be approximately equal to the can diameter. Because of the dimensions of the opening, portions of an end can abut portions of the end panel to retain the can in the carrier until removed. Removal of a can requires that it be pivoted out through the larger inner end portion of the dispenser opening.

Although this approach may work satisfactorily for the carrier for which it was designed, it would be desirable to provide dual dispensers for multi-layer packages which simplify the can removal process. Additionally, it would be desirable to provide dispenser openings which need not be separated by a section of the end panels.

Brief Summary of the Invention

The basic dispenser opening employed in the carrier of the invention is an opening in one of the panels which abuts the side of an adjacent article. The opening extends into a panel which abuts the end of the article. The opening has a length at least as long as the height of the articles and a height throughout a substantial portion of the opening which is less than the width of the articles. Preferably, the opening is covered by a tear-away section connected to the panels by tear lines.

In a package containing two stacked layers of articles the dispenser opening is substantially as long as twice the height of the articles, and the dispenser cover includes a tear line which is substantially aligned with adjacent abutting ends of adjacent stacked articles.

The dispenser opening may be provided in either a side panel or an end panel. If the opening is in a side panel the carrier rests on an end panel when in the dispensing mode. If it is in an end panel the carrier rests on a side

panel when in the dispensing mode. When the opening is in an end panel a tear-away cover section is provided not only in the end panel flaps, but also in the underlying end panel glue flap in order to provide access to the interior
5 of the carrier.

Articles are easily removed through the dispenser opening either from one layer or from both, yet are prevented from prematurely exiting the carrier due to the narrow width of the opening. Either carrier is readily
10 formed from a single blank of economical design.

These and other features and aspects of the invention, as well as other benefits, will readily be ascertained from the detailed description of the preferred embodiments described below.

15 Brief Description of the Drawings

FIG. 1 is a pictorial view of a sleeve-type carrier of the present invention, with a portion of the carrier removed to show the interior;

FIG. 2 is a plan view of a blank for forming the
20 carrier of FIG. 1;

FIG. 3 is a partial pictorial view of the carrier of FIG. 1 shown at an interim stage of formation;

FIG. 4 is a partial pictorial view of the carrier of FIG. 1, showing the carrier with the dispensers in
25 operative position;

FIG. 5 is a partial elevation of the side panel of the carrier containing the dispenser openings, with a portion of the side panel removed to reveal the packaged cans behind the dispensers;

FIG. 6 is a partial pictorial view similar to that of FIG. 4, but showing the carrier with one of the dispenser opening covers removed;

FIG. 7 is a partial side elevation of the carrier shown in FIG. 6;

FIG. 8 is a partial side elevation, showing the
35 carrier with both dispenser covers removed;

FIG. 9 is a pictorial view similar to that of FIG. 1, but showing a modified carrier;

FIG. 10 is a plan view of a blank for forming the carrier of FIG. 10;

FIG. 11 is a partial pictorial view of the carrier of FIG. 9 shown at an interim stage of formation;

5 FIG. 12 is a partial pictorial view of the carrier of FIG. 9, showing the carrier with the dispensers in operative position; and

FIG. 13 is a partial end elevation of the carrier of FIG. 9, with a portion of the dispenser covers removed to
10 reveal the lower ends of the end panel glue flaps.

Detailed Description of the Preferred Embodiments

Referring to FIG. 1, the package 10 is comprised of sleeve-type carrier 12 having a top panel 14, side panels 16, end panels 18 and bottom panel 20. Two layers of
15 beverage cans C are housed in the carrier and are aligned so that the cans in the upper layer are in stacked relationship with the cans in the lower layer. The upper ends of the cans in the upper layer are adjacent the top panel 14 and the lower ends of the cans in the lower layer
20 are adjacent the bottom panel 20. The end panels are comprised of end panel flaps 22 and 24 connected to the top and bottom panels, respectively. Handle openings 26 are provided in the end panel flaps 22 to permit the carrier to be lifted by its ends. A large tear-away section 28
25 extends from the top panel 14 into the far side panel 16 to provide access to the interior of the carrier in order to remove all the cans from the package as a group. Although not visible in this view, an alternative tear-away section is also provided in the far end panel. According
30 to the invention, two adjacent tear-away sections 30 in the near side panel adjacent the end panel 18 function as dispenser covers which, when removed, allow a beverage can to be taken one at a time from either or both layers.

Referring to FIG. 2, a blank 32 for forming the
35 carrier is comprised of paperboard or other material having sufficient strength and flexibility to be folded into place and to function as carrier material. Bottom panel section 20 is connected on opposite sides by fold lines 34 to side

panel sections 16, one of which is at the end of the blank and the other of which is in the interior of the blank. The interior side panel section 16 is connected by fold line 36 to top panel section 14, which in turn is connected
5 by fold line 38 to glue flap 40. The top panel section 14 and glue flap 40 include part of the tear-away section 28 while the side panel section 16 at the end of the blank includes the remaining part.

Connected to the ends of bottom panel section 20 by
10 fold lines 42 are the lower end panel flaps 24, one of which includes alternative tear-away section 44. The upper end panel flaps 22, which include the handle openings 26, are similarly connected to the top panel section 14 by fold lines 46. End panel dust flaps or glue flaps 48 are
15 connected to the side panel sections 16 at one end of the blank by fold lines 50, while end panel glue flaps 51 and 52 are connected to the side panel sections 16 at the opposite end of the blank by fold lines 53 and 54, respectively. Handle cutouts 56 are included in each of
20 the end panel glue flaps. The glue flaps 48 are recessed at 58 to provide access to the interior of the carrier when the tear-away section 44 is removed.

The interior side panel section 16 also includes the two adjacent dispenser tear-away sections 30 adjacent the
25 fold line 53. The sections 30 are identical, extending from common tear line 60 to the fold lines 34 and 36 along tear line 62. The tear line 62 continues into the adjacent top and bottom panel sections 14 and 20 as arcuate tear lines 63, which terminate at the intersection of the fold
30 line 53 with the fold lines 34 and 36. It will be understood that the connecting fold line 53 is also a tear line, comprised of slits 64 separated by integral webs 66 of material to form a perforated easily torn line. Each tear-away section 30 includes a tab 68 which is connected
35 to the main body of the tear-away section by fold line 70.

To form a carrier from the blank the top, bottom and side panel sections are folded along the fold lines 34 and 36 to form a sleeve configuration and the glue strip 40 is

adhered to the opposite side panel section 16 to secure the structure in place. Typically, the sleeves so formed are shipped in collapsed form to a packaging plant where the sleeves are erected and the fabrication process continues.

5 Two layers of beverage cans are then introduced through the open ends of the erected sleeve, after which the end glue flaps 48, 51 and 52 are folded in and the end panel flaps 22 and 24 are glued to them to complete the carrier package. FIG. 3 shows one end of the carrier in an interim
10 stage of formation after the end glue flaps 51 and 52 have been folded into place but before the end panel flaps 22 and 24 have been folded and glued. The handle cutouts 56 in the glue flaps 51 and 52 meet to form an opening which is aligned with the handle opening 26 when the end panel
15 flap 22 is in its final position. The dispenser tear-away sections 30 can be seen to extend into the side panel 16 adjacent the fold line 53. Formation of the carrier package is completed by gluing the end panel flaps 22 and 24 to the end glue flaps 48, 51 and 52.

20 To use the dispenser, the carrier is placed so that it rests on the end panel adjacent the tear-away sections 30, as shown in FIG. 4. It can be seen that one of the tear-away sections 30 extends into the adjacent top panel 14. A similar arrangement exists with the other tear-away
25 section, which extends into the adjacent bottom panel hidden from view in this drawing figure. As best seen in FIG. 5, the tear line 60 is equally spaced from the top and bottom panels and is substantially aligned with the interior ends of the layers of cans C. The length of a
30 dispenser opening after the covering tear-away section has been removed is therefore substantially equal to the height of a can. Except at the tab portion 68 of the tear-away section 30, the tear line 62 is spaced from the bottom panel a distance such that the width of a dispenser opening
35 is less than the diameter of a can.

When it is desired to remove a can from the package one of the tabs 68 is pushed in and folded down about the fold line 70, allowing the cover section to be easily

grasped and separated from the carrier. The adjacent cans do not interfere with the inward movement of the tab 68 since the tab moves into the space created by the curvature of the side walls of adjacent cans in the layer. The carrier at this point is as illustrated in FIGS. 6 and 7. Although the entire length of the adjacent can is exposed, because its diameter is greater than the width of the opening along a substantial portion of its length, the can is restrained from rolling out through the opening. To remove the can it is merely necessary to grip the can and pull it out. The side panel at the upper edge of the dispenser opening is readily flexed up as the can is pulled to a point which permits the can to move through the opening. As the can is pulled out the next can above it falls down to occupy the same position. This second can is restrained and prevented from exiting, however, as the flexibility and memory of the side panel cause it to immediately return to its original condition once the first can has passed through the opening. Gripping the can is facilitated by the fact that the illustrated dispenser opening extends into the bottom panel of the carrier, exposing a portion of the end of the can.

Cans may be removed from both layers by removing both of the tear-away covers 30 to expose both dispenser openings, as shown in FIG. 8. Even though this exposes the full length of both of the adjacent cans, they cannot roll out of the carrier because they are unable to move past the restraining side panels at the upper edge of the openings. Removal of one or both of the adjacent cans is readily accomplished as explained above.

Another embodiment of the invention is shown in FIG. 9, wherein the package 72 comprises carrier 74 housing two layers of beverage cans C. The top panel 76 of the carrier is comprised of two overlapping top panel flaps 78 and 80 which are glued together in the overlapped area. The flaps are connected by fold line to form upper end panel flap 82 which together with adjacent lower end panel flap 84 form the end panels of the carrier. Side panels 86 extend

between the end panels and are connected by fold lines to the top and bottom panels. Handle openings 88 in the top panel allow the carrier to be lifted by one hand while stress relief score lines 89 extend from the handle openings to the corners of the carrier to better distribute lifting and carrying stresses. As in the first embodiment, tear-away sections 28 and 44 provide access to the interior of the carrier if it is desired to remove all the cans at the same time, while tear-away sections 30 in the near end panel allow removal of one can at a time from each of the layers.

Referring to FIG. 10, a blank 90 for forming the carrier of FIG. 9 is comprised of a centrally located bottom panel section 92 connected to the side panel sections 86 by fold lines 94 and to the end panel flaps 84 by fold lines 96. One of the side panel sections is connected to the top panel flap 78 by fold line 98 and the other side panel section is connected to the top panel flap 80 by fold line 100. Handle reinforcing flap 102 is connected to the top panel flap 100 at the edge opposite the adjacent side panel section 86 by fold line 104, which is interrupted by slits 105. The reinforcing flap 102 includes a centrally located recessed area 106. End panel glue flaps 108 are foldably connected to opposite ends of the side panel sections by fold lines 110 while end panel glue flap 112 is connected by fold line 114. Fold line 114 is similar in construction to fold line 53 of the first embodiment in that it is comprised of spaced slits which function as a tear line as well as a fold line. The glue flap 112 includes a tear line 116, which is interrupted by cutout 118, and a tear line 120 which extends between the fold line 114 and the tear line 116 substantially parallel to and midway between the fold lines 94 and 100.

Connected by fold lines 122 to the opposite ends of top panel flap 78 are end panel flaps 124. End panel flaps 126 are similarly connected by fold lines 128 to opposite ends of top panel flap 80. Note that the fold lines 128 extend through the handle reinforcement flap 102. The

tear-away sections 30 are located in the end panel flap 84 and the top panel flap 126 adjacent the end glue flap 112. As in the first embodiment, the tear-away sections 30 are formed by tear lines 62, including tabs 68, and tear line extensions 63.

To form a carrier from the blank 90, the reinforcement flap 102 is folded and glued to the inner surface of the top panel flap 80, and the top, bottom and side panel sections are folded as in the first embodiment to form a sleeve. The outer top panel flap 78 overlaps and is glued to the inner top panel flap 80, with the reinforced portion of the top panel flap 80 lying between the handle openings 88. The end panel flaps 126 also overlap and are glued to the end panel flaps 124 to form the end panel flaps 82 shown in FIG. 9. As described above, the layers of beverage cans are then introduced and the end panels are formed from the end panel glue flaps 108 and 112 and from the end panel flaps 82 and 84. FIG. 11 shows one end of the carrier in an interim stage of formation after the end glue flaps 108 and 112 have been folded into place but before the end panel flaps 82 and 84 have been folded and glued. The tear-away section in the flap 112 is positioned to be aligned with the tear-away sections 30 after the end panel flaps 82 and 84 are folded into place, with the tear line 120 being aligned with the end edges of the end panel flaps 82 and 84. The cutout 118 in the flap 112 is designed to be aligned with the tab 68 in the end panel flap 84, while the tab 68 in the end panel flap 82 is positioned to be inwardly spaced from the inner sloped edge of the flap 112. The dispenser tear-away sections 30 extend into the top and bottom panels.

To use the dispenser, the carrier is placed so that it rests on the side panel adjacent the tear-away sections 30, as shown in FIG. 12. As best seen in FIG. 13, the tear line 120 is equally spaced from the side panels and is substantially aligned with the interior ends of the layers of cans C. It will be understood that the relative dimensions of the dispenser opening are similar to the

dimensions of the dispenser openings of the first embodiment and that the same procedure is used to remove a can from the package. In this case, when a tear-away dispenser cover 30 is removed the tear-away section behind it in the glue flap 112 is also grasped and removed, with the latter tear-away section being separated at the tear line 120.

It will now be clear that the invention provides an improved dispenser which is particularly useful in packages containing more than one layer of articles, but which may be employed in single-layer packages as well. The dispenser opening is as long as the height of the article, thereby facilitating removal of the article and avoiding the design-restrictive need for a centrally located section between adjacent dispenser openings. Further, the concepts of the invention may be employed whether the dispensers are provided in a side panel or an end panel, making possible a choice of handle designs.

A package formed from the carrier of the invention may, if desired, include a separator sheet between the layers of articles, in which case the dispenser openings may be slightly longer than the height of an article to compensate for the thickness of the separator sheet. Although the articles themselves have been identified in the description as beverage cans, other types of articles which are adapted to be stacked and removed through a dispenser opening may also be packaged in the manner described.

Obviously, although the invention has been described in connection with a carrier designed to hold eighteen beverage cans in each layer, the principles of the invention may be incorporated in carriers designed to hold different numbers of articles. Because the invention is not necessarily limited to all the specific details described in connection with the preferred embodiments, except as they may be within the scope of the appended claims, changes to certain features of the preferred embodiments which do not alter the overall basic function

and concept of the invention are contemplated.

WHAT IS CLAIMED IS:

- 1 1. A package comprised of an article carrier
2 containing a plurality of adjacent articles having sides
3 of similar height and ends of similar widths, the carrier
4 comprising:
5 top, bottom, side and end panels connected together
6 to form an enclosure;
7 one of the panels abutting the side of an adjacent
8 article;
9 another one of the panels abutting the side of said
10 adjacent article and extending from a first edge of said
11 one panel at substantially right angles thereto;
12 a further one of the panels abutting the end of said
13 adjacent article and extending from a second edge of said
14 one panel at substantially right angles thereto;
15 an article dispenser opening in said one panel, the
16 opening having a length at least as long as the height of
17 the articles and a width throughout a substantial portion
18 of the opening which is less than the width of the
19 articles; and
20 said further panel including an opening adjacent at
21 least a portion of the end of an adjacent article, said
22 opening extending into the dispenser opening in said one
23 panel.
- 1 2. A package as defined in claim 1, wherein said one
2 panel includes a dispenser opening cover connected to said
3 one panel by a tear line.
- 1 3. A package as defined in claim 2, wherein the
2 dispenser opening cover includes a tab extending into said
3 one panel a distance greater than the width of the
4 articles.
- 1 4. A package as defined in claim 3, wherein the tab
2 includes a fold line extending transversely of said further
3 panel, the fold line being spaced from said another panel
4 a distance substantially equal to the width of the
5 articles.
- 1 5. A package as defined in claim 2, wherein said
2 further panel includes an opening cover connected to said

3 further panel by a tear line.

1 6. A package as defined in claim 1, wherein the
2 package contains two layers of articles in stacked
3 relationship, the article dispenser opening in said one
4 panel having a length which is substantially as long as
5 twice the height of the articles.

1 7. A package as defined in claim 6, wherein said one
2 panel includes a dispenser opening cover connected to said
3 one panel by a tear line, the cover including a tear line
4 which is substantially aligned with adjacent abutting ends
5 of adjacent stacked articles.

1 8. A package as defined in claim 7, wherein the
2 package includes an additional panel spaced from and
3 substantially parallel to said further panel, said
4 additional panel including an opening adjacent at least a
5 portion of the end of an adjacent article, said opening
6 extending into the dispenser opening in said one panel and
7 said additional panel including an opening cover connected
8 to said additional panel by a tear line.

1 9. A package as defined in claim 2, wherein said one
2 panel is a side panel and said another panel is an end
3 panel.

1 10. A package as defined in claim 2, wherein said one
2 panel is an end panel and said another panel is a side
3 panel.

1 11. A package as defined in claim 10, wherein said
2 end panel is comprised of end glue flaps connected to the
3 side panels and end panel flaps connected to the top and
4 bottom panels, the end panel flaps being adhered to the end
5 glue flaps.

1 12. A package as defined in claim 11, wherein the
2 dispenser opening cover is in one of the end panel flaps,
3 the end glue flap adhered to said one end panel flap
4 including a tear-away section substantially aligned with
5 the dispenser opening cover.

1 13. A package as defined in claim 12, wherein the
2 package contains two layers of articles in stacked
3 relationship, the article dispenser opening in said one

4 panel having a length which is substantially as long as
5 twice the height of the articles and wherein the dispenser
6 opening cover is in both of the end panel flaps.

1 14. A package as defined in claim 13, wherein the
2 dispenser opening cover is in both of the end panel flaps,
3 the end glue flap adhered to said end panel flaps including
4 a tear-away section, the tear-away section including a tear
5 line which is substantially aligned with adjacent abutting
6 ends of adjacent stacked articles.

1 15. A blank for forming an article carrier for
2 packaging a plurality of adjacent articles having sides of
3 similar predetermined height and ends of similar
4 predetermined widths, the blank comprising:

5 top, bottom and side panel sections having end edges;
6 end flaps connected to the end edges of the top,
7 bottom and side panel sections for forming end panels of
8 a carrier formed from the blank;

9 an article dispenser opening cover in a side panel
10 section, the opening cover being connected to the side
11 panel section by a tear line in the side panel section and
12 by a tear line coincident with a fold line connecting the
13 side panel section to an associated end flap, the opening
14 cover having a length at least as long as said
15 predetermined height and a width throughout a substantial
16 portion of the opening cover which is less than said
17 predetermined width; and

18 the opening cover extending into an adjacent top or
19 bottom panel section, the opening cover extension being
20 connected to said top or bottom section by a tear line.

1 16. A blank as defined in claim 15, wherein the
2 dispenser opening cover includes a tab extending into said
3 side panel a distance greater than said predetermined
4 width.

1 17. A blank as defined in claim 15, wherein the
2 dispenser opening cover extends into both adjacent top and
3 bottom panel sections, the dispenser opening cover in the
4 side panel section having a length which is substantially
5 as long as twice said predetermined height.

1 18. A blank as defined in claim 17, wherein the
2 dispenser cover in said side panel section includes a tear
3 line which is substantially equally spaced from the
4 adjacent top and bottom panel sections.

1 19. A blank for forming an article carrier for
2 packaging a plurality of adjacent articles having sides of
3 similar predetermined height and ends of similar
4 predetermined widths, the blank comprising:

5 side panel sections having inner edges connected to
6 a top or bottom panel section and outer edges connected to
7 partial top or bottom panel flaps, said sections and flaps
8 having end edges;

9 an end flap connected by a fold line to each of said
10 end edges for forming end panels of a carrier formed from
11 the blank;

12 an article dispenser opening cover in a first end flap
13 connected to one of the side panel sections, the dispenser
14 opening cover being connected to said one side panel
15 section by a tear line coincident with the fold line
16 connecting said first end flap to said side panel section;

17 a second article dispenser opening cover in a second
18 end flap adjacent said first end flap, the second dispenser
19 opening cover being connected to said second end flap by
20 a tear line;

21 the tear lines of the first and second dispenser
22 opening covers extending transversely of each other;

23 the second dispenser opening cover having a length at
24 least as long as said predetermined height and a width
25 throughout a substantial portion of the second dispenser
26 opening cover which is less than said predetermined width;
27 and

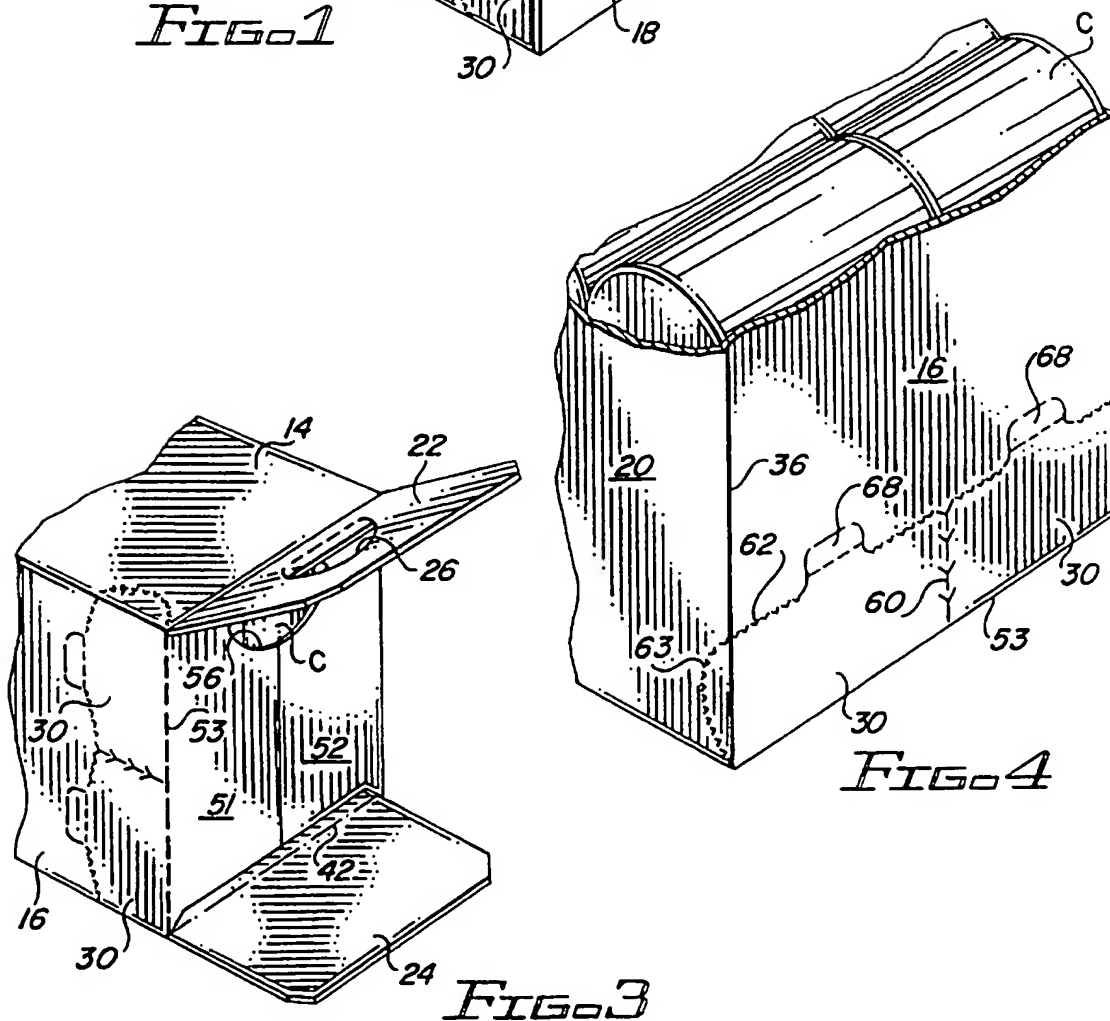
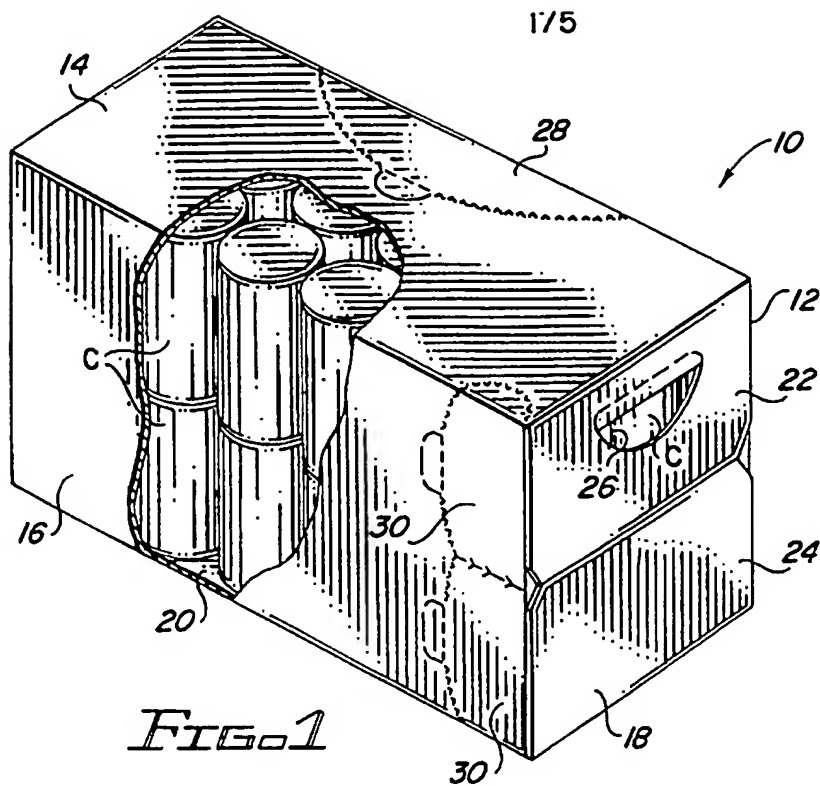
28 the second dispenser opening cover extending into an
29 adjacent top or bottom panel section, the second dispenser
30 opening cover extension being connected to said top or
31 bottom section by a tear line.

1 20. A blank as defined in claim 19, wherein the
2 second dispenser opening cover includes a tab extending
3 into said second end flap a distance greater than said

4 predetermined width.

1 21. A blank as defined in claim 19, including a third
2 article dispenser opening cover in a third end flap
3 adjacent said first end flap, the third dispenser opening
4 cover being connected to said third end flap by a tear
5 line, the tear lines of the first and third dispenser
6 opening covers extending transversely of each other, the
7 third dispenser opening cover having a length at least as
8 long as said predetermined height and a width throughout
9 a substantial portion of the third dispenser opening cover
10 which is less than said predetermined width, and the third
11 dispenser opening cover extending into an adjacent top or
12 bottom panel section, the third dispenser opening cover
13 extension being connected to said top or bottom section by
14 a tear line.

1 22. A blank as defined in claim 21, wherein the
2 dispenser cover in said first end flap includes a tear line
3 which is substantially equally spaced from the adjacent
4 second and third end flaps.



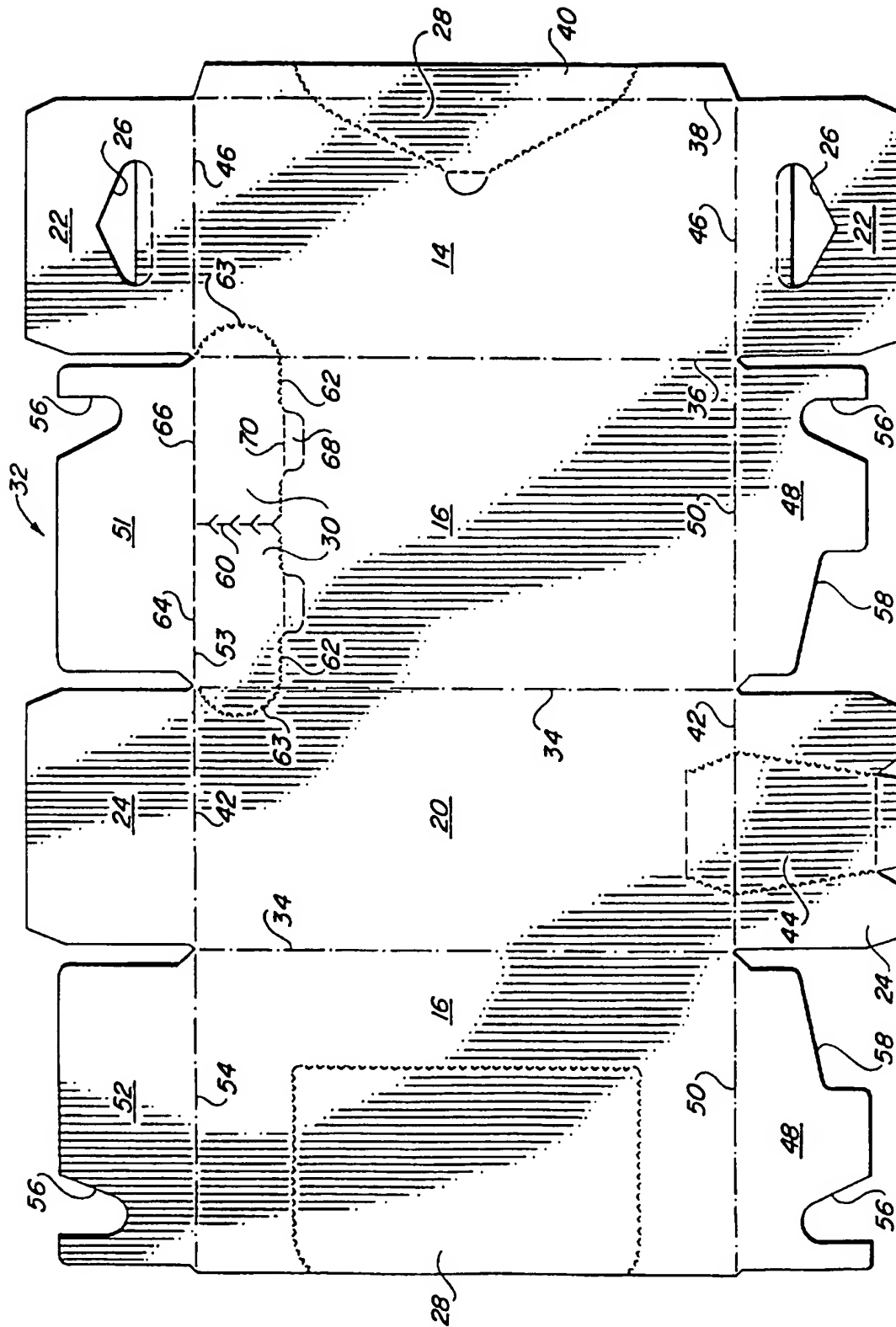


FIG. 2

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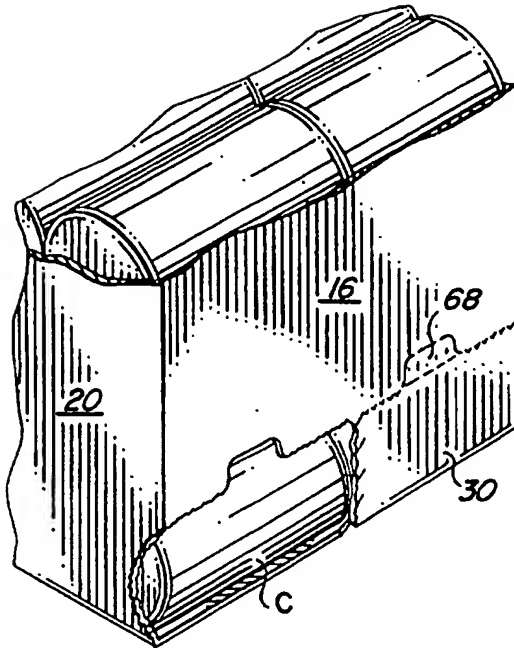


FIG. 6

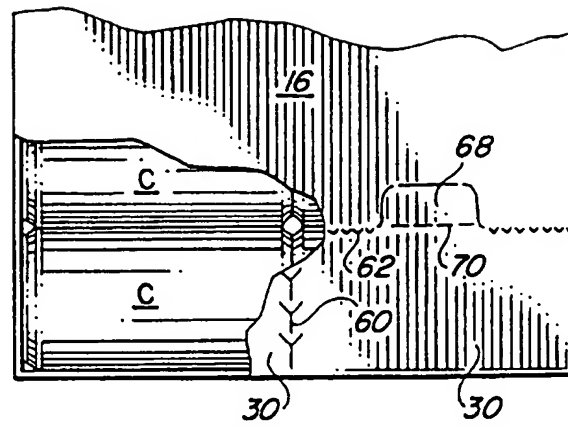


FIG. 5

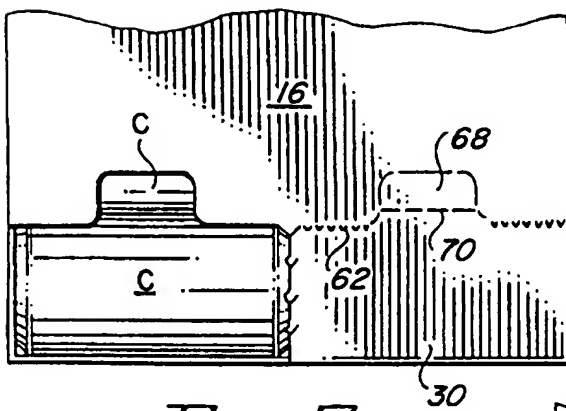


FIG. 7

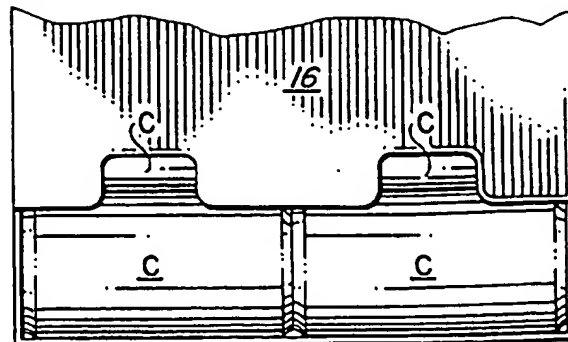


FIG. 8

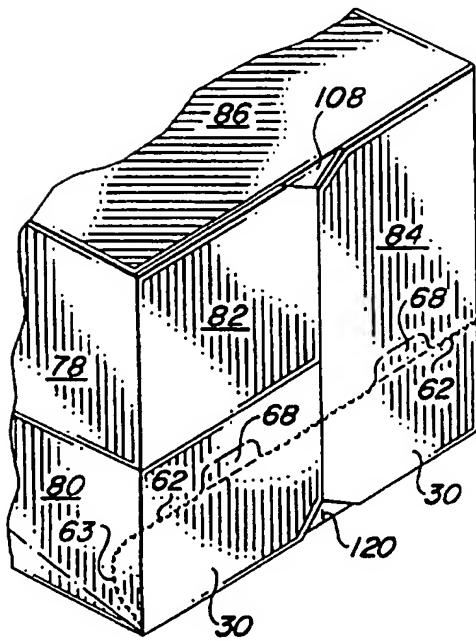
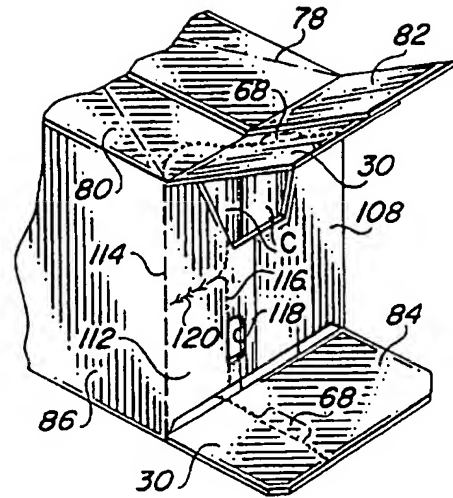
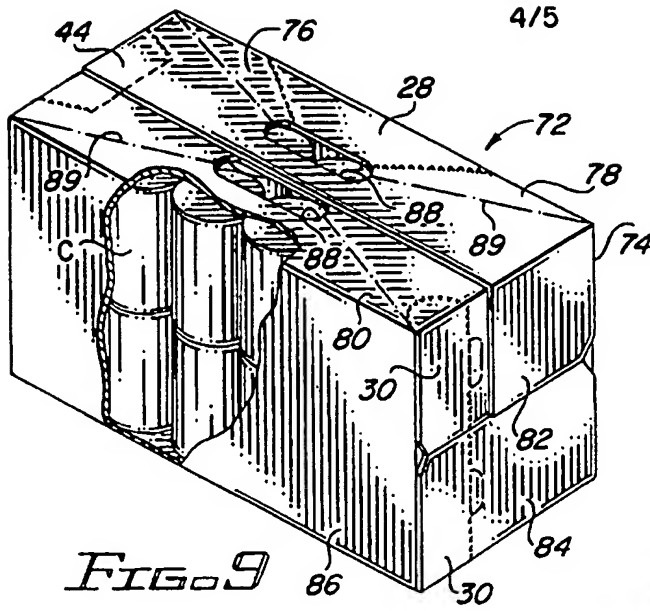
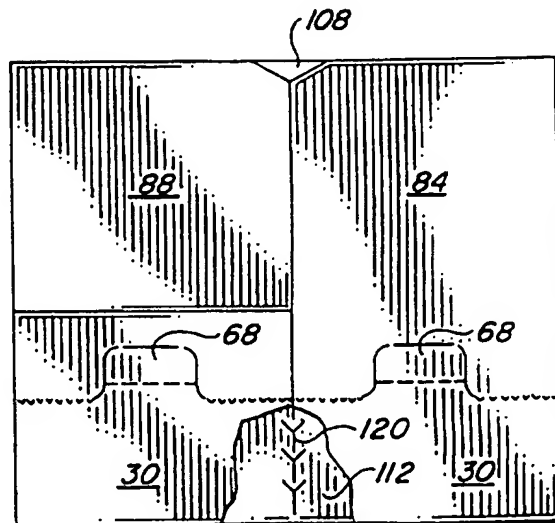


FIG. 13



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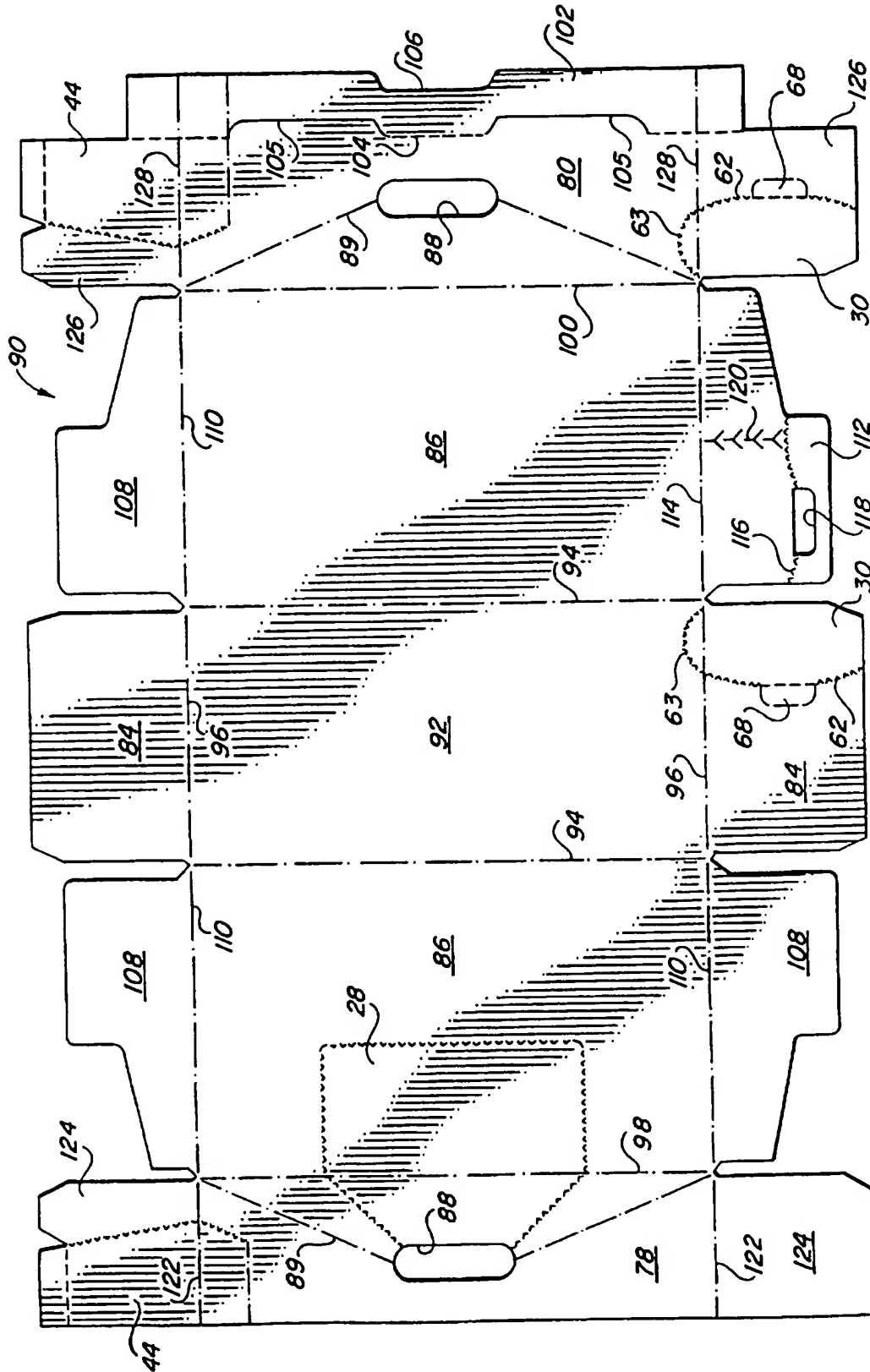


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/15802

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : B65D 65/00, 5/00, 5/72
US CL : 206/427, 815; 229/ 103.2, 103.3, 121, 122.1, 243, 244
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 206/427, 815; 229/ 103.2, 103.3, 121, 122.1, 243, 244

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ----- Y	US 5,368,194 A (OLIFF et al) 29 November 1994, See entire document	15-16 ----- 1-10, 17-18
X ----- Y	US 5,505,372 A (EDSON et al) 09 April 1996, See entire document	19-20 ----- 21-22
Y	US 5,333,734 A (STOUT et al) 02 August 1994, See entire document	11-14
Y	US 4,364,509 A (HOLLEY, JR. et al) 21 December 1982, See Figures 4 and 5	1-2, 15, 17-18
A	US 5,246,112 A (STOUT et al) 21 September 1993	1,15
A	US 4,216,861 A (OLIFF) 12 August 1980	1,15

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"I" document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"G" document member of the same patent family
"(i)" document referring to an oral disclosure, use, exhibition or other means	
"(j)" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

29 NOVEMBER 1996

Date of mailing of the international search report

27 DEC 1996

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